AIR FORCE

QUALIFICATION TRAINING PACKAGE

(AFQTP)

for

STRUCTURAL

(3E3X1)

MODULE 20

FINISH CARPENTRY

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MODULE 20

FINISH CARPENTRY

Career Field Education and Training Plan (CFETP) references from 1 Apr 97 version.

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AIR FORCE QUALIFICATION TRAINING PACKAGES
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INTRODUCTION

Before starting this AFQTP, refer to and read the "Trainee/Trainer Guide" located on the AFCESA Web site **http://www.afcesa.af.mil/**

AFQTPs are mandatory and must be completed to fulfill task knowledge requirements on core and diamond tasks for upgrade training. ***It is important for the trainer and trainee to understand*** that an AFQTP ***does not*** replace hands-on training, nor will completion of an AFQTP meet the requirement for core task certification. AFQTPs will be used in conjunction with applicable technical references and hands-on training.

AFQTPs and Certification and Testing (CerTest) must be used as minimum upgrade requirements for Diamond tasks.

MANDATORY minimum upgrade requirements:

Core task:
AFQTP completion
Hands-on certification

Diamond task:
AFQTP completion
CerTest completion (80% minimum to pass)

Note: *Trainees will receive hands-on certification training for Diamond Tasks when equipment becomes available either at home station or at a TDY location*.

Put this package to use. Subject matter experts under the direction and guidance of HQ AFCESA/CEOT revised this AFQTP. If you have any recommendations for improving this document, please contact the Structures Career Field Manager at the address below.

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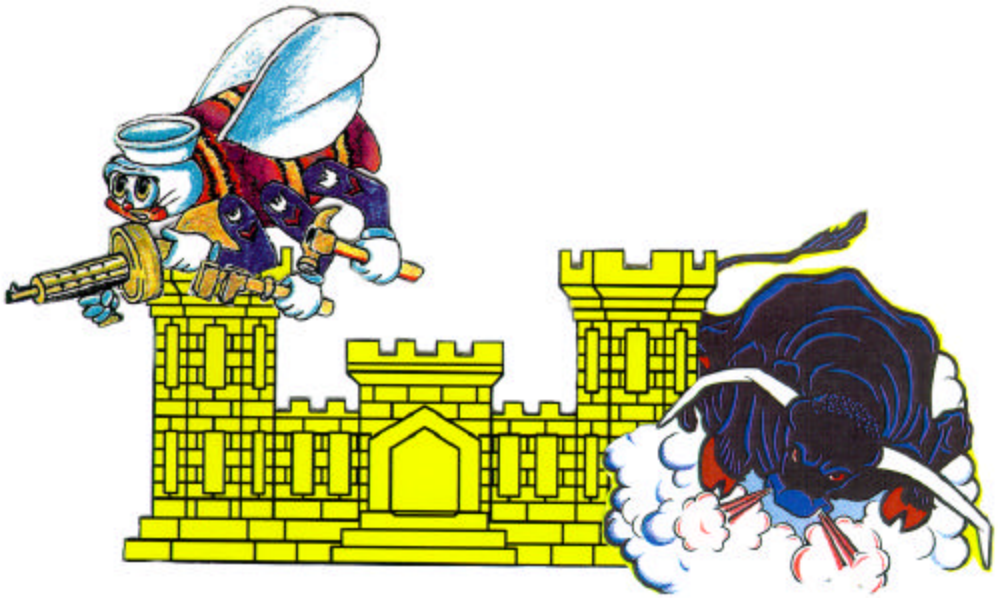
Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.



GYPSUM BOARD

MODULE 20 AFQTP UNIT 2

INSTALL (20.2.1.)

INSTALL

Task Training Guide

STS Reference Number/Title:	20.2.1. Install
Training References:	• 3E351 CDCs • MODERN CARPENTRY by Willis H. Wagner • NAVEDTRA 12521
Prerequisites:	• Possess as a minimum, a 3E331 AFSC
Equipment/Tools Required:	• General 3E3X1 tool kit • Personal safety equipment • 4' level • T-square • Screw gun • 4 or 6 foot step ladder • 1/2 or 5/8-inch gypsum board • 1 1/4-inch drywall nails • 1 1/4-inch drywall screws • Drywall hammer • Scaffolding (for high ceilings)
Learning Objective:	• Trainee should be able to install gypsum board sheets on ceilings and walls
Samples of Behavior:	• Trainee will install gypsum board on ceilings and walls using appropriate materials, tools, and methods
Notes:	
• Any safety violation is an automatic failure.	

INSTALL

Background: Gypsum board is a fire retarding material that comes in standard 4-foot widths and lengths from 8 to 16 feet. Plaster finish is still used in building construction today although gypsum board drywall has become most popular. Gypsum saves time, whereas plaster requires a much longer drying time. There are several different types of gypsum board, including: regular, fire resistant (type "X"), insulating, backing board, and moisture resistant or water resistant (green-board and blue-board). Gypsum board is available with different edge styles including: tapered, beveled, round, square, and tongue and groove. For the remainder of this QTP we will deal specifically with regular gypsum board manufactured with tapered edges. Gypsum board is available in thickness from 1/4 to 3/4-inch. The most commonly used thickness' are 1/2 and 5/8-inch.

Three types of fasteners are commonly used for installing gypsum board. They are nails, screws and adhesives. Regardless of the type of fastener used, it is most important that the wallboard is drawn tightly against the framing. This is best accomplished by using a drywall nail long enough to penetrate the wood at least 3/4-inch and 5/8-inch for drywall screws (see figure 1). For screws used to attach gypsum board to metal framing, the depth of penetration should be a minimum of 3/8-inch.

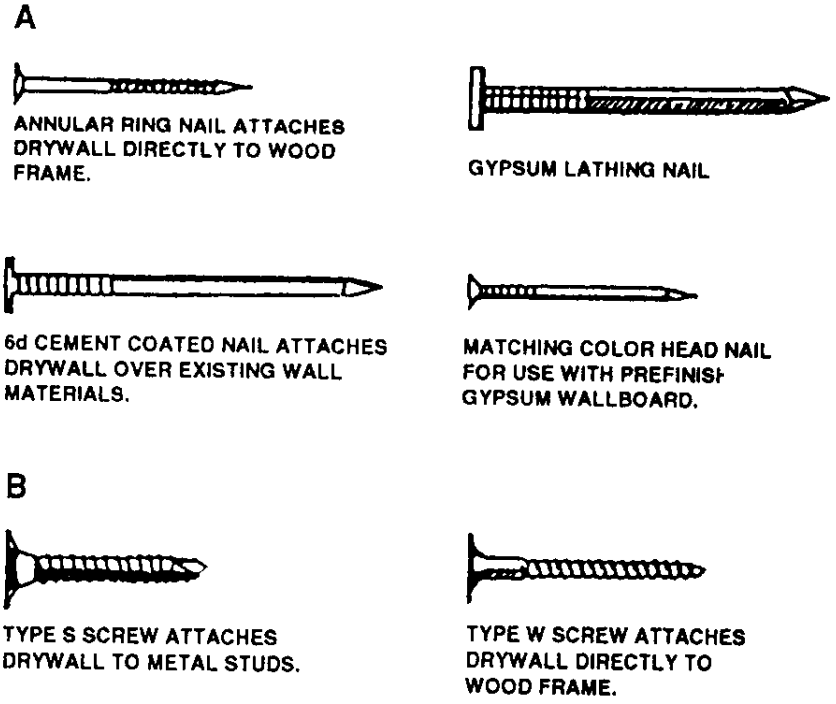


Figure 1, Drywall fasteners

SAFETY:
DUE TO THE SIZE AND WEIGHT OF A FULL SHEET OF GYPSUM BOARD, TRAINEE MAY NEED HELP SETTING UP AND INSTALLING IT.

When single nailing, space nails 6 to 8 inches apart on walls, and 5 to 7 inches apart on ceiling. Place nails at least 3/8-inch from any outside edges. If double nailing, the centers of nail pairs should be approximately 12 inches apart. (Figure 2 shows proper spacing for both methods). Because of their greater holding power, screws may be spaced 12 inches apart on ceilings, and 16 inches apart on walls. Because of this, screws are often the fastener of choice in today's building construction. Dimple each nail or seat each screw below the plane of the gypsum boards surface. This will provide a pocket that can be filled with joint compound later when finishing (See figure 3).

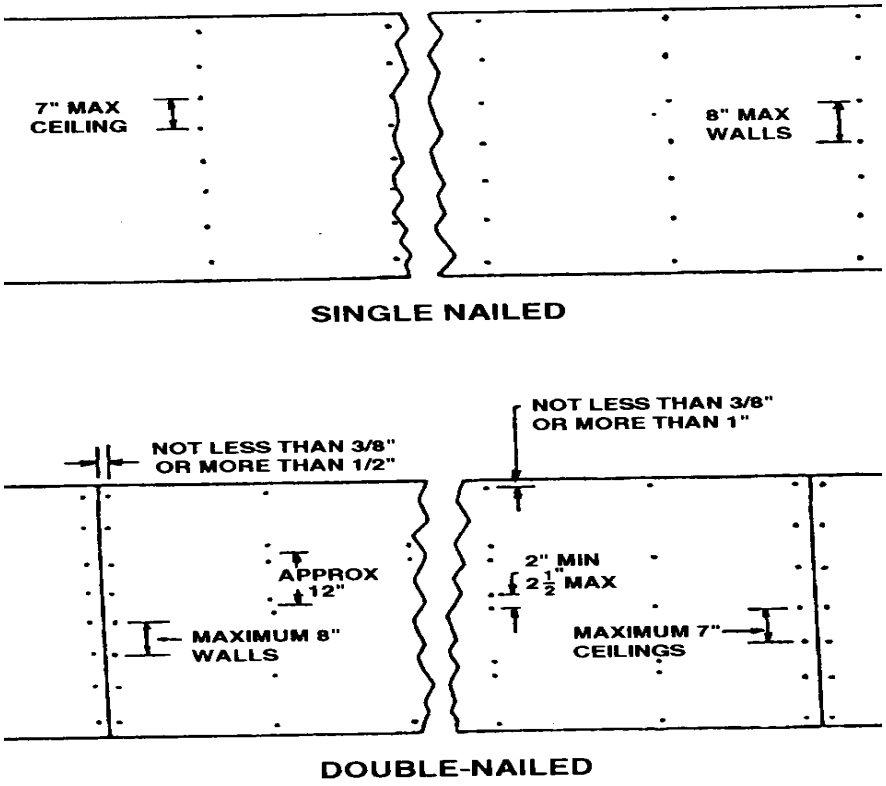


Figure 2, Spacing for Single and Double nailing of Gypsum Drywall.

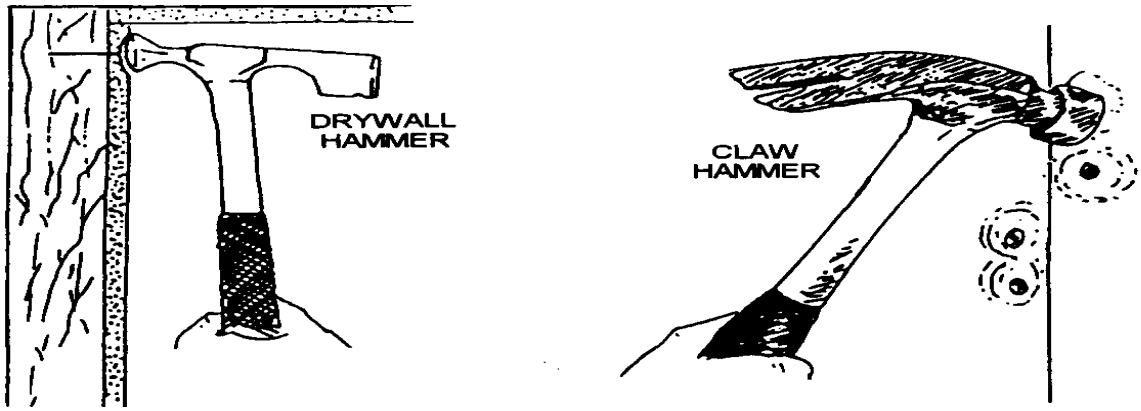


Figure 3, Dimpling of Gypsum Drywall.

Screws or nails should accompany adhesive when it is used to fasten sheets. They are only needed to hold the sheet in place until the adhesive dries. Therefore, they may be placed along tapered edges eliminating the need to use joint compound to cover nail or screw heads in the center of the sheets.

When installing gypsum board, always start in one corner of the ceiling, with the length of the sheet at a right angle to the joist. Attach it with nails or screws in the center first, working outward. Stagger all butt seams to minimize long joints and increase strength. Leave 1/8-inch gap between sheets to help hold joint compound. When necessary, sheets may be cut by scoring with a utility knife, and snapping off, or using a saw (drywall, keyhole, or reciprocating) as shown in Figure 4.

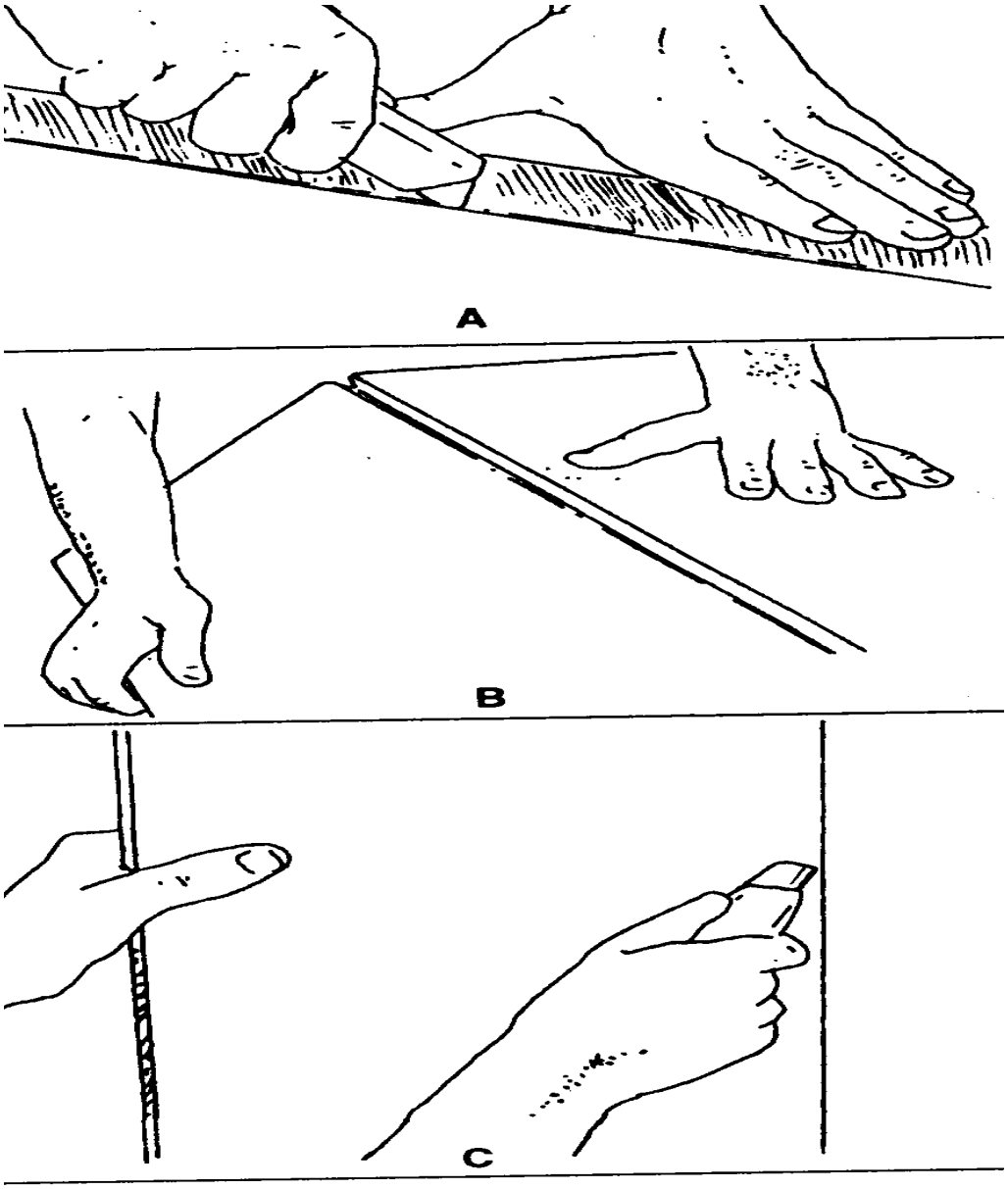


Figure 4, Cutting Gypsum Drywall.

Gypsum board may be installed on walls horizontally or vertically. Horizontally is preferred because it reduces the number of vertical joints. Stagger all butt joints and place them above and below windows or above doors (See Figure 5). Be sure to position sheets so that no tapered edges border any rough openings. This will prevent the bevel on the sides of the sheet from interfering with the finish trim.

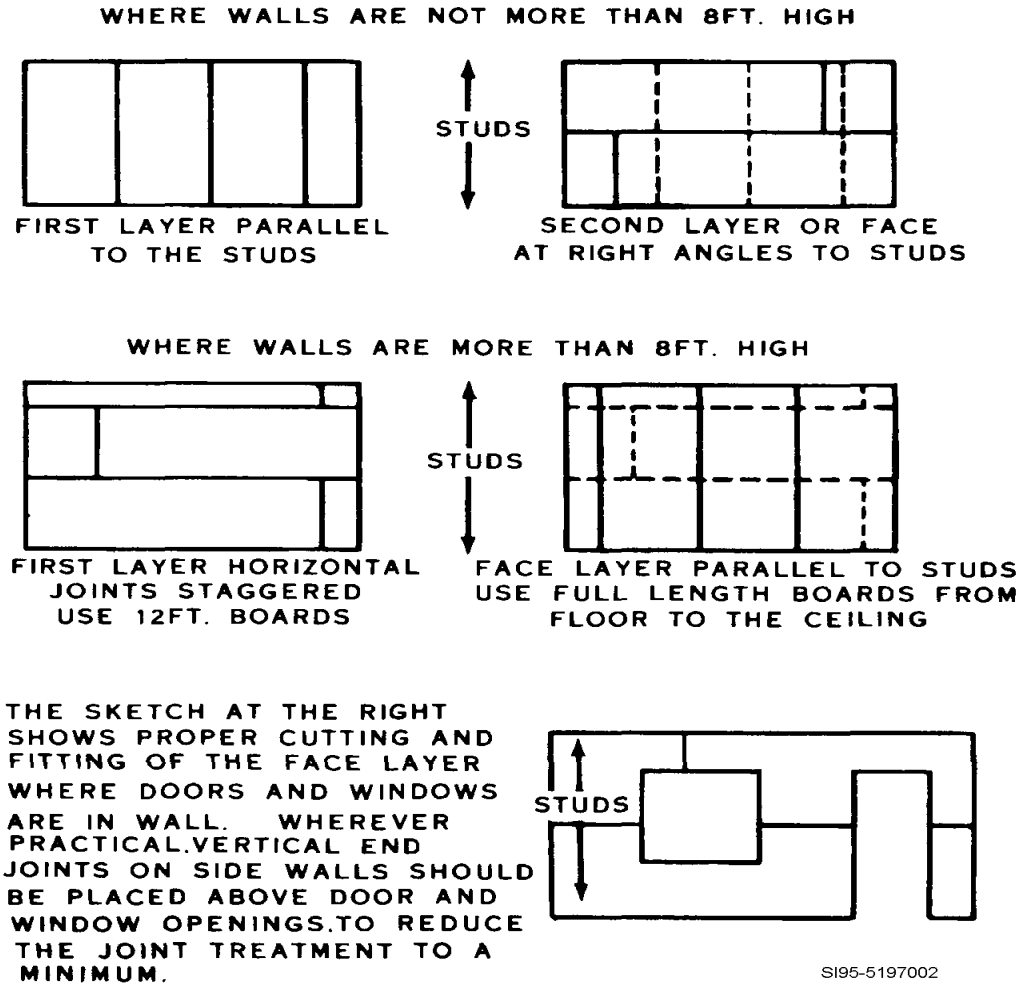


Figure 5, Placing Gypsum Wallboard.

To properly install gypsum board, follow these steps:

Step 1: Gather required tools and materials.

Having the proper equipment will save time by preventing you from having to go back to the shop and retrieve additional tools. Some of the tools you will need are a general toolbox, 4-foot level, T-square, 4 or 6-foot stepladder, screw gun, gypsum board, nails or screws, and a drywall hammer.

Step 2: Determine layout.

Determine the layout of the gypsum board to be attached to ceilings and walls. Try to minimize continuous seams and attach sheets at right angles to framing members to increase strength.

Step 3: Ceiling installation.

Install gypsum board sheets on the ceiling starting in one corner, preferably at right angles to ceiling joists. Any openings or fixtures in ceilings will require sheets to be cut before being raised into position. Use a drywall lift or T-brace to hold sheet firmly against joists. Secure with appropriate fasteners beginning in the center and working to the outside edges. Use scaffolding for application on higher ceilings. Be sure to stagger all butt seams. Leave 1/8 inch space between sheets to help hold joint compound.

HINT:
Use a drywall square to mark lines on sheets referencing all framing members. This will aid greatly in the placement of fasteners.

SAFETY:
ENSURE YOU HAVE YOUR EYE PROTECTION ON BEFORE CUTTING AND NAILING OPERATIONS.

Step 4: Wall installation.

Place marks on the ceiling and floor to identify stud locations. Layout and then saw or cut for any openings or fixtures on walls. Door or window openings may be cut out after sheets are secured to wall. Sheets should be raised to meet ceiling using a foot lifter or blocks. Secure sheets to walls using appropriate fasteners and spacing. Be sure to leave a 1/8-inch space between sheets to help hold joint compound.

Review Questions
for
Install

Question	Answer
1. Gypsum board is a fire retarding material that comes in standard __ foot width and lengths from __ to __ feet.	a. 3, 6, 16. b. 3, 8, 16. c. 4, 6, 16. d. 4, 8, 16.
2. What are the three common types of fasteners used for gypsum board?	a. nails, screws, and adhesives. b. nails, screws, and joint compound. c. nails, screws, and anchor bolts. d. nails, corner bead, and adhesives.
3. What are the two most common thickness of drywall?	a. 3/8 and 1/2 inch. b. 3/8 and 5/8 inch. c. 1/2 and 5/8 inch. d. 1/4 and 1/2 inch.
4. Drywall nails for installing gypsum board should be long enough to penetrate the wood at least _____.	a. 1/2 inch. b. 5/8 inch. c. 3/8 inch. d. 3/4 inch.
5. When single nailing gypsum board on walls the nail spacing should be _____.	a. 6 to 10 inches apart. b. 4 to 6 inches apart. c. 8 to 10 inches apart. d. 6 to 8 inches apart.
6. Always leave a ___ inch space between sheets to help hold joint compound.	a. 1/16 inch. b. 1/8 inch. c. 3/16 inch. d. 3/32 inch.
7. Gypsum sheets may be cut by scoring with a _____.	a. hawk-bill knife. b. putty knife. c. broad knife. d. utility knife.
8. What can be used to firmly hold gypsum board sheets against ceiling joists?	a. Drywall lift or T-brace. b. Foot lifter or T-brace. c. Foot lifter or drywall lift. d. All of the above.

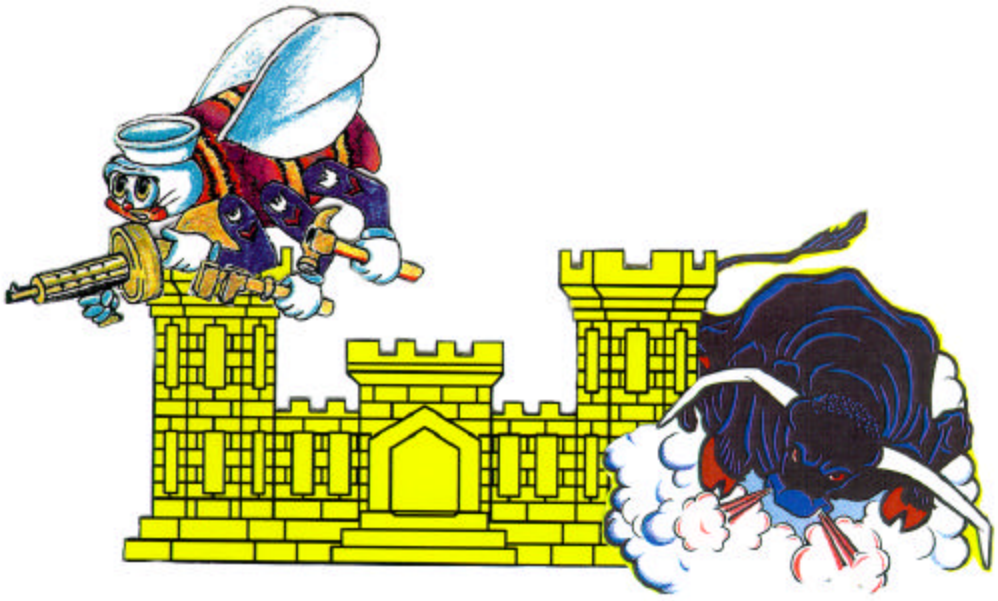
Review Questions
for
Install

Question	Answer
9. Why should you position sheets so that no tapered edges border any rough openings?	a. To prevent weakening the opening. b. Because all tapered edges should be saved for joining other sheets. c. To prevent the bevel on the sides of the sheet from interfering with the finish trim. d. Because tapered edges are only used on ceiling.
10. What are the approved saws for cutting gypsum board?	a. Drywall, keyhole, circular and reciprocating. b. Drywall, keyhole, circular and coping. c. Drywall, table, saber and reciprocating. d. Drywall, keyhole, and reciprocating.

INSTALL

Performance Checklist		
Step	**Yes**	**No**
1. Did the trainee gather the required equipment, tools, and materials?		
2. Did the trainee correctly determine layout for gypsum sheets?		
3. Did the trainee install gypsum board on the ceiling correctly?		
4. Did the trainee install gypsum board on the walls correctly?		
5. Did the trainee use the proper nail spacing?		
6. Did the trainee use the proper saws to cut gypsum board?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



GYPSUM BOARD

MODULE 20 **AFQTP UNIT 2**

PATCH (20.2.3.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PATCH

Task Training Guide

STS Reference Number/Title:	• 20.2.3. Patch
Training References:	• 3E351 CDCs • MODERN CARPENTRY by Willis H. Wagner • NAVEDTRA 12520
Prerequisites:	• Possess as a minimum, a 3E331 AFSC
Equipment/Tools Required:	• General 3E3X1 tool kit • Personal safety equipment • 6-inch drywall finish knife • 12-inch drywall finish knife • Gypsum board • Joint tape • Joint compound • Backing material • Mud pan
Learning Objective:	• Upon completing this section, you should be able to describe the procedures for repairing gypsum board.
Samples of Behavior:	• Trainee will be able to successfully and safely patch gypsum board.
Notes:	
• Any safety violation is an automatic failure.	

PATCH

Background: One of your jobs as a structural specialist is to repair gypsum board or drywall. You will find it time consuming, but you must have patience.

Most drywall blemishes are caused by structural shifting or water damage. Like any other repair job, be sure to correct the underlying problem before making the repairs. The extent of the damage will determine the method of repair. For example, a crack will require filling with joint compound and a small puncture hole will require backing material to support the "mud". Larger damage may result in replacing an entire sheet. Being familiar with the procedures for hanging and finishing drywall will benefit you in understanding this section.

To perform this task, follow these steps:

Step 1: Gather required equipment.

Having the proper equipment will save time by preventing you from having to go back to the shop and retrieve additional tools. Some of the tools you will need are a general toolbox, personal safety equipment, 6 and 12 inch drywall knifes, gypsum board, joint tape, and joint compound.

Step 2: Prep the damaged area.

Holes. Cut the damaged area square to eliminate the need for irregular cuts. Keep the hole size to a minimum. Cut only what's needed to remove the damaged area. Lightly sand around the edges of the hole to ensure proper adhesion of the joint compound.

Cracks. Small cracks can be easily repaired by gouging out the crack with a utility knife and filling it with joint compound. Be sure to remove any loose gypsum and paper from the crack before applying the joint compound. Larger cracks will require joint compound and joint tape over the crack, as in a normal joint.

Step 3: Install patch or backing.

If a sharp object has dented the drywall, sand around the cavity and fill it with spackling compound. A larger hole (bigger than your fist) should have a backing. One repair method is shown in Figure 1. First, cut the edges of the hole clean with a utility knife (View A). The piece of backing should be somewhat larger than the hole itself. Drill a small hole into the middle of the backing piece and thread a piece of wire into the hole. This wire allows you to hold the piece of backing in place. Spread mastic around the edges of the backing. When the adhesive is tacky, fit the backing diagonally into the hole (View B) and, holding onto the wire, pull the piece against the backside of the hole. When the mastic is dry, push the wire back into the wall cavity. The backing stays in place. Now, fill the hole with plaster or joint compound (View C) and finish (View D).

NOTE:
This is just one of several options available for repairing large surface damage to gypsum board.

Holes larger than 8 inches should be cut back to the centers of the nearest studs. Although you should have no problem nailing a replacement piece to the studs, the top and the bottom of the new piece must be backed. The best way to install backing is to screw drywall gussets (supports) to the back of the existing drywall. Then, put the replacement piece in the hole and screw it to the gussets.

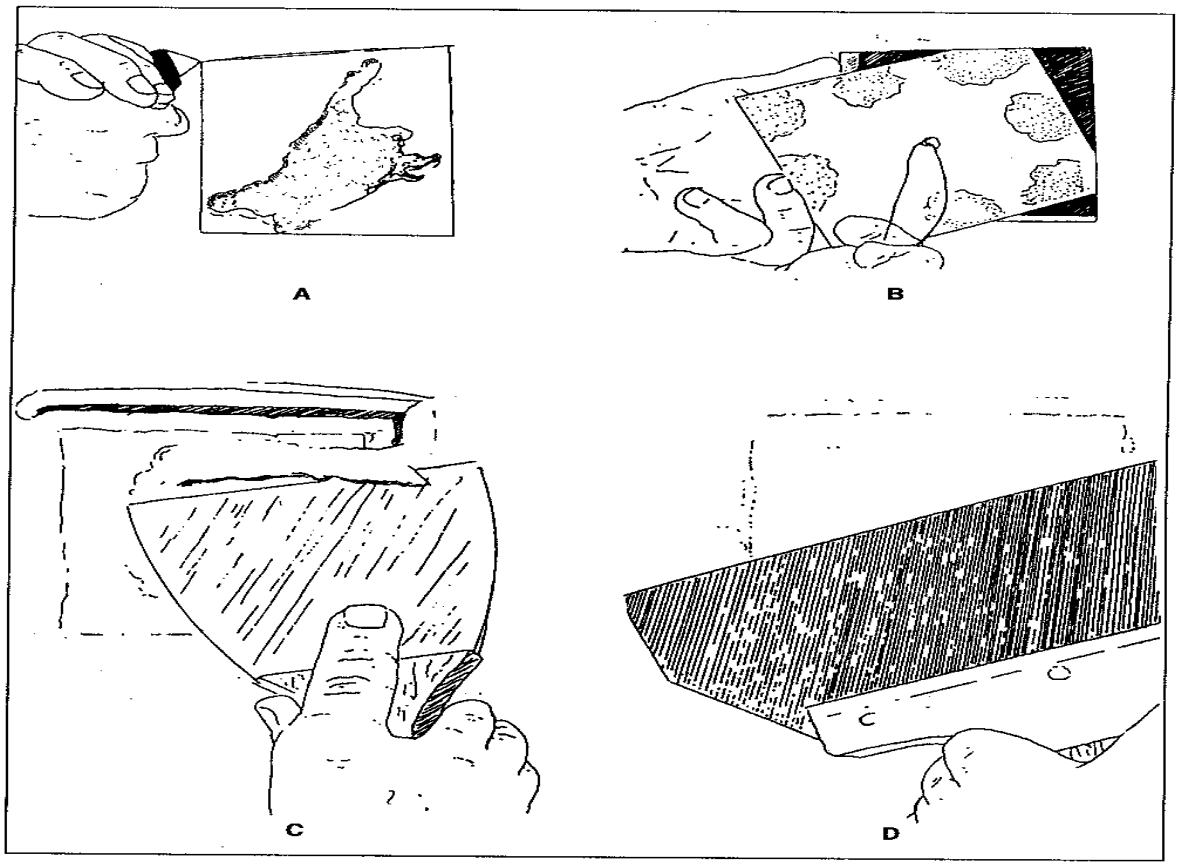


Figure 1, Repairing a large hole in Drywall.

Step 4: Finish gypsum patch.

Finishing patches is much the same as it is in finishing new gypsum construction. The finishing of gypsum board drywall is generally a three-coat application. Attention to drying times between coats prevents rework, which has a cost involved as well as extra time. Where sheets of drywall join, the joints are covered with joint tape and compound (See Figure 2). The following procedure should be followed:

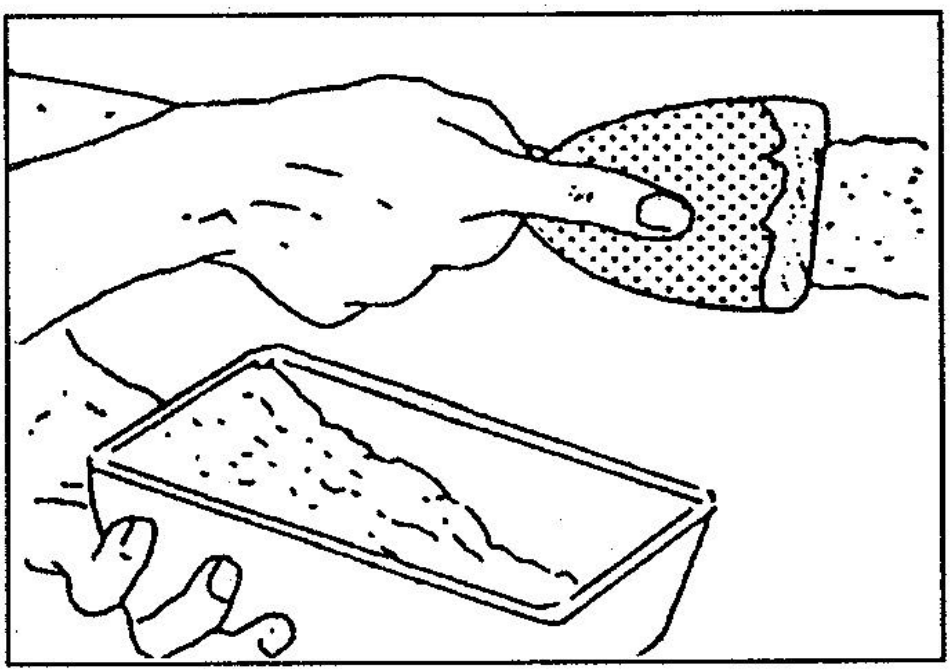
a. Spread a swath of bedding compound about 4 inches wide down the center of the joint (Figure 2, View A). Press the tape into the center of the joint with a 6-inch drywall finish knife (View B). Apply another coat of compound over the first to bury the tape (View C). As you apply the compound over the tape, bear down so you take up any excess. Scrape clean any excess, as sanding it off can be tedious.

b. When the first coat is dry, sand the edges with fine-grit sandpaper while wearing personal protective equipment. Using a 12-inch drywall finish knife, apply a topping of compound 2 to 4 inches wider than the first application (View D).

c. Sand the second coat of compound when it is dry. Apply the third and final coat, feathering it out another 2 to 3 inches on each side of the joint. You should be able to do this with a 12-inch drywall finish knife. Otherwise, you should use a 16-inch feathering trowel.

d. After the final coat has dried you will need to finish sanding all areas very lightly to remove any bumps that remain, if there are any. Some carpenters prefer to use a damp sponge to clean up the final coat. Care must be taken to rub the area very lightly with the sponge to avoid removing too much material.

e. Nail and screw holes can usually be covered in two passes, though shrinkage sometimes necessitates three.



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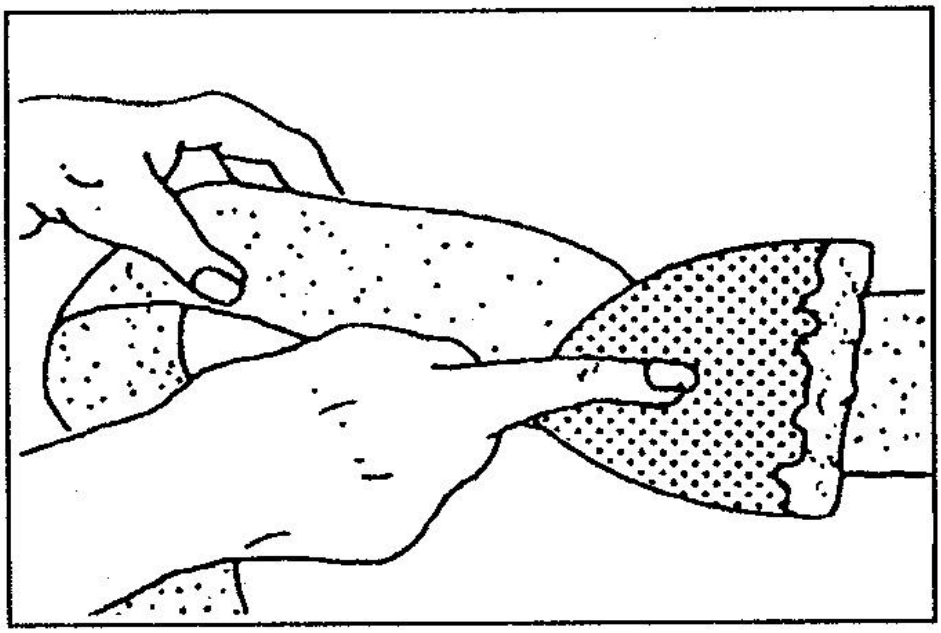


B

Figure 2, Finishing Drywall Joints.

Review Questions for Patch

Question	Answer
1. What are the primary causes of drywall blemishes?	a. Structural shifting and water damage. b. Improper backing material. c. Joint compound dried to fast. d. Cuts were irregular.
2. Why is it necessary to sand the edges of the repair hole?	a. To eliminate the need for irregular cuts. b. To support the backing material. c. To ensure proper adhesion to the joint compound. d. In order to let the mud dry faster.
3. Small cracks can be easily repaired by _____.	a. cutting out the damaged area and placing a patch in the hole. b. gouging out the crack and filling it with joint compound. c. placing backing behind the crack and filling it with joint compound. d. placing tape over the crack and finishing as normal.
4. What is the purpose of placing a wire through the backing material?	a. To ensure proper adhesion to the face of the drywall. b. To allow the joint compound to be feathered easier. c. To keep the crack from cracking again. d. To allow you to hold the backing in place.
5. The first coat of joint compound should be applied using a_____.	a. 6-inch drywall knife. b. 12-inch drywall knife. c. putty knife. d. drywall trowel.

PATCH

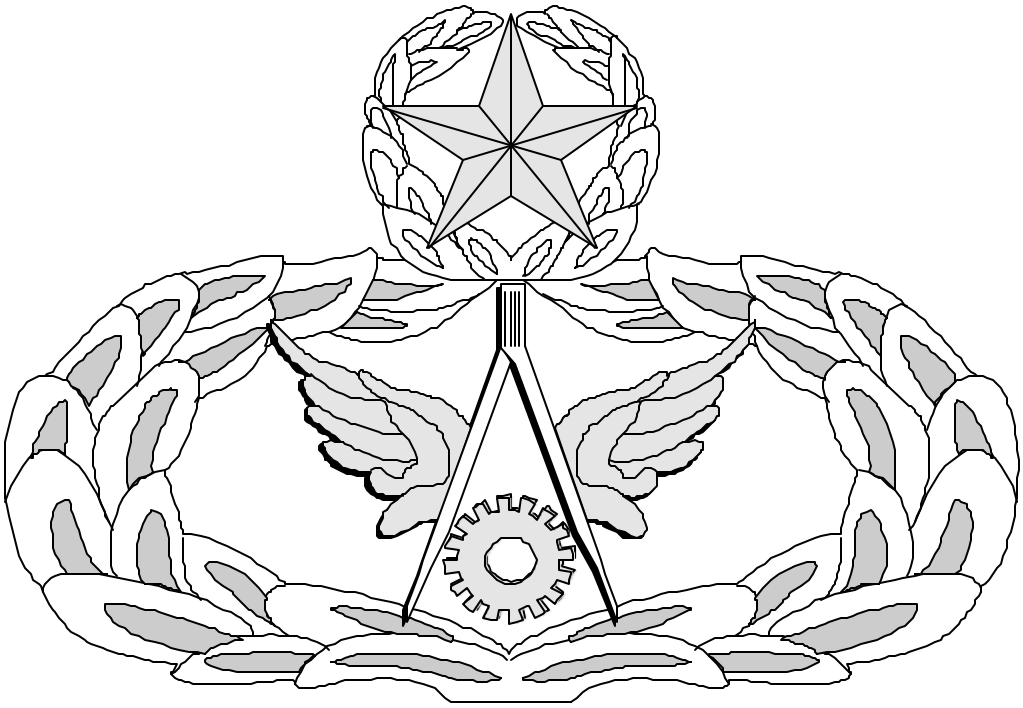
Performance Checklist		
Step	**Yes**	**No**
1. Did the trainee gather the required tools and equipment?		
2. Did the trainee properly prep the damaged area?		
3. Did the trainee use the proper methods for installing patching?		
4. Did the trainee use the proper methods for installing backing?		
5. Did the trainee finish the patch properly?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

Air Force Civil Engineer

QUALIFICATION TRAINING PACKAGE (QTP)

REVIEW ANSWER KEY



for

STRUCTURAL

(3E3X1)

MODULE 20

FINISH CARPENTRY

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

INSTALL

(3E3X1-20.2.1.)

Question	Answer
1. Gypsum board is a fire retarding material that comes in standard __ foot width and lengths from __ to __ feet.	d. 4, 8, 16.
2. What are the three common types of fasteners used for gypsum board?	a. Nails, screws, and adhesives.
3. What are the two most common thickness of drywall?	c. ½ and 5/8 inch.
4. Drywall nails for installing gypsum board should be long enough to penetrate the wood at least _____.	d. ¾ inch.
5. When single nailing gypsum board on walls the nail spacing should be _____.	d. 6 to 8 inches apart.
6. Always leave a ___ inch space between sheets to help hold joint compound.	b. 1/8 inch.
7. Gypsum sheets may be cut by scoring with a_____.	d. utility knife.
8. What can be used to firmly hold gypsum board sheets against ceiling joists?	a. Drywall lift or T-brace.
9. Why should you position sheets so that no tapered edges border any rough openings?	c. To prevent the bevel on the sides of the sheet from interfering with the finish trim.
10. What are the approved saws for cutting gypsum board?	d. Drywall, keyhole, and reciprocating.

PATCH

(3E3X1-20.2.3.)

Question	Answer
1. What are the primary causes of drywall blemishes?	a. Structural shifting and water damage.
2. Why is it necessary to sand the edges of the repair hole?	c. To ensure proper adhesion to the joint compound.
3. Small cracks can be easily repaired by ____.	b. gouging out the crack and filling it with joint compound.
4. What is the purpose of placing a wire through the backing material?	d. To allow you to hold the backing in place.
5. The first coat of joint compound should be applied using a_____.	a. 6-inch drywall knife.